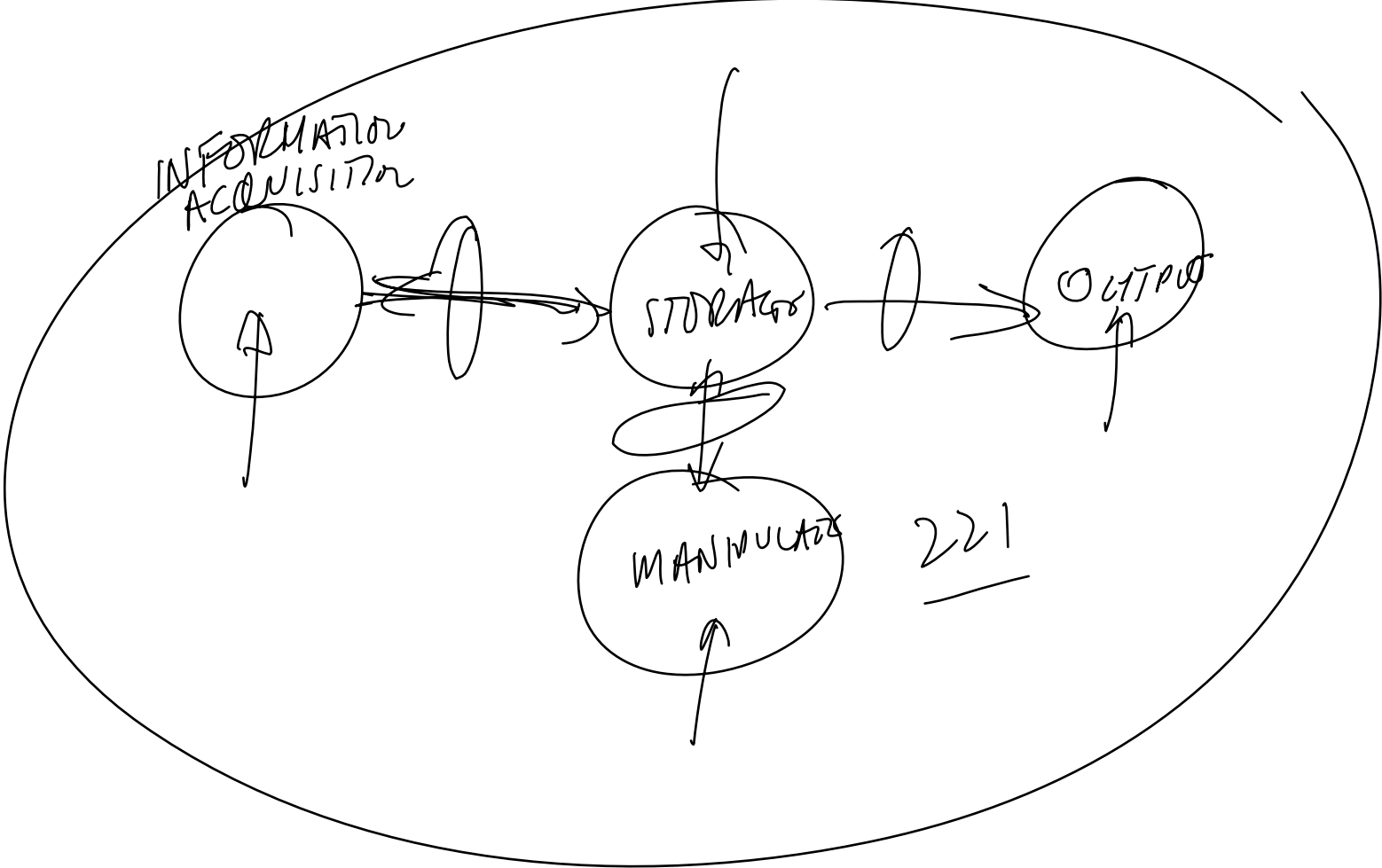


# ECSE-322

Lecture 3

9 January 2008

Information Communication



# How Is Information Transferred?

- Communications modes?

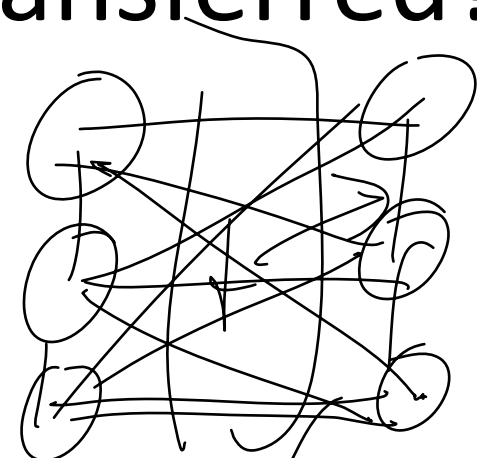
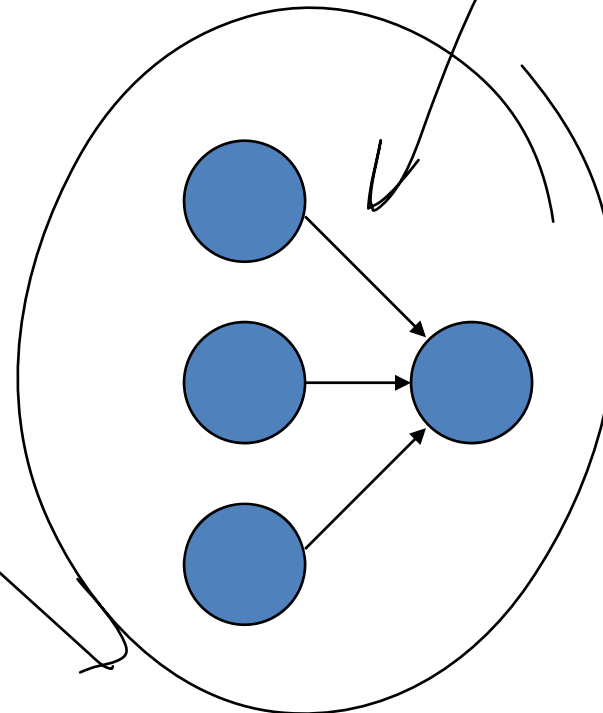
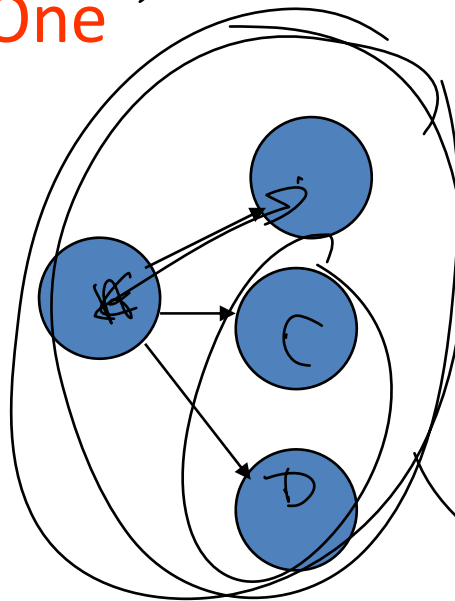
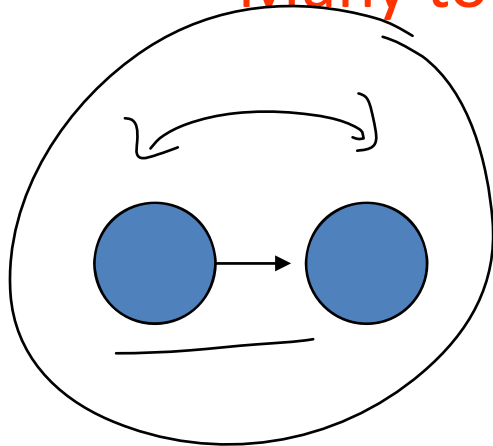
# How Is Information Transferred?

- Communications modes?

- One to One ✓

- One to Many ✓

- Many to One ✓



One-way or two-way?

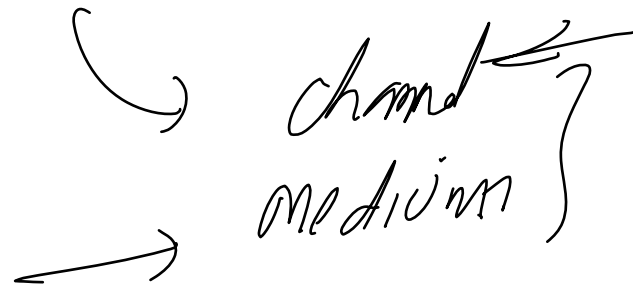
# One-to-one Reliable Communications

- How do we do it?

# One-to-one Reliable Communications

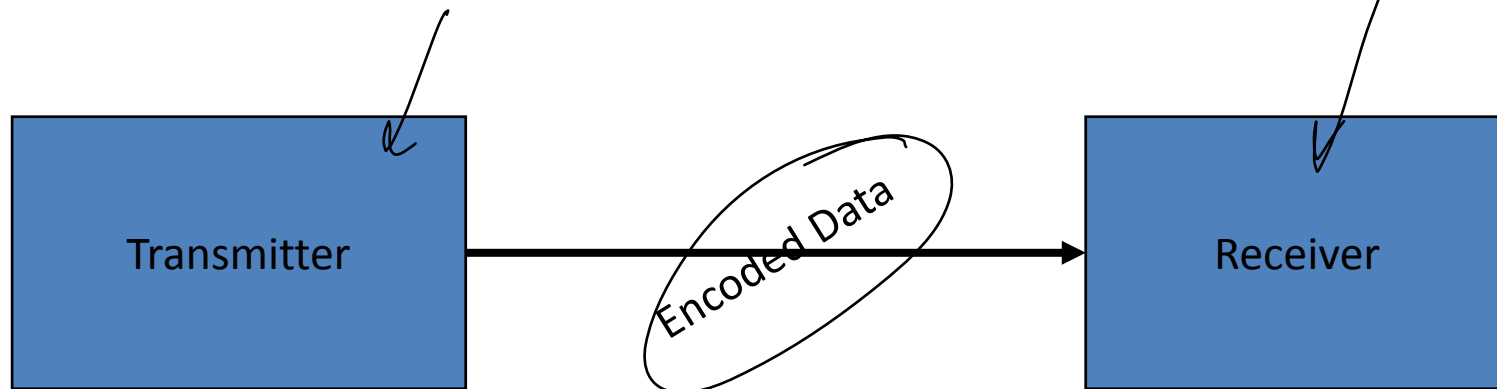
- How do we do it?
  - How do we communicate using sound? ✓
  - What other communications methods (non-electronics) do we use?
  - Is there anything common to all the methods?

channel  
medium

A handwritten diagram consisting of the words 'channel' and 'medium' stacked vertically. A large right-facing curly bracket is drawn to the right of both words, grouping them together. To the left of the word 'channel', there is a curved arrow pointing from the left towards the word. Below that, there is a straight arrow pointing from the left towards the word 'medium'.

# One-to-one Reliable Communications

- The concept of a “message”
  - Information to be transmitted is encoded – usually into a sequence of “phonemes” or alphabetic characters on “paper”
  - The encoded data is placed in a physical communications channel...



# One to One Reliable Communications

- How do we know who is the “transmitter” and who is the “receiver”?
- How does the receiver determine the contents of the message?
- How does the transmitter know that the receiver got the message (and understood it)?


*All these questions need to be answered if the system is to be reliable...*



# One to One Reliable Communications

- Consider the situation of telling someone about your holiday...
  - What is the process?
    - (a) when you are on holiday ✓
    - (b) when you have returned ✓

# Message Structures

- So we have:
  - A message has **content** – i.e. the information that is to be passed from one individual to another.
  - A message has a **start** and an **end**. ✓
  - A message has a “**source**” and a “**destination**”  


# Message Structures

- Content:

- Encoded data – needs to follow an encoding process agreed on by the sender and the receiver.

- The encoding process depends on the physical structure being used.

# Message Structures

- Start and End:
  - (Depends on a convention set up and agreed to by the sender and the receiver.
  - Depends on the physical medium being used..)

# Message Structures

- Source and Destination:
  - Where is the message coming from? ✓
  - Where is it going to? ✓
  - Both are important – the destination is critical but so is the source of the message...
    - Knowing the source may allow further decoding of the information

# Message Types

- Messages can contain different classes of information....
  - Such as?

# Message Types

- Messages can contain different classes of information....
  - Such as?
    - Data
    - Commands
  - Messages can be used to pass data or to control operations, i.e. to send and receive orders...

# Message Timing

- When can messages be sent?
  - Consider:
    - Mailing a letter...
      - Letters are picked up for transport at a particular time
      - Letters are delivered at a particular time (and all together)
    - A home security system checking with the central office
      - Happens at the same time every day
  - These are SYNCHRONOUS operations – messages (information) is only transferred at specific times.
  - Other synchronous operations?



# Message Timing

- When can messages be sent?
  - Consider:
    - A phone call..
      - The source calls the destination at an arbitrary time ✓
      - The phone rings at the destination to indicate a call is present ✓
      - The phone is answered.. ✓
    - Sending a package by courier
      - When the package is ready, the courier is called ✓
  - These are **ASYNCHRONOUS** operations – i.e. the message is passed after a “conversation” to set up the link.

# Messages

- So what have we got?
  - Messages can be sent *synchronously*, i.e. an event (passing the message) happens at a specific time
  - Messages can be sent *asynchronously*, i.e. a set of operations have to be completed before the message is passed – a “**cause-and-effect**” system.
- Throughout the course we will see examples of both of these..

# Synchronous Systems

- Need to be able to specify time
  - e.g. *“this lecture will be given at 12:30”*
  - We all have watches which provide the synchronization information
  - Thus **two channels** are used:
    - The “**watch channel**” for synchronization
    - The “**speech channel**” for the information (message)

# Asynchronous Systems

- The phone call
  - The “cause-and-effect” is set up on the same channel as the message is transmitted, i.e. the **sound channel**
- The courier
  - The signal setting up the message transfer can use a **“speech channel”** , i.e. the phone
  - The message is passed on the **“truck channel”**, i.e. the package is shipped in a truck

# Identification of the Destination and Source

- In a “one-to-one” conversation, this is implicit – the communications channel connects two individuals.
- Other “one-to-one” systems...
  - E.g. sending a letter
    - Requires an “address” on the envelope (the message container)
    - In this case, there are a very large number of potential destinations (all the addresses in the world) – all on the same channel.. (the global mailing system)
    - Sometimes the source must be identified via a “return address”.

# Communications Rules

- The lecture example..
  - A Synchronous event – we all arrive at the same time and the message starts. (two channels in parallel)
  - A “one-to-many” transmission – the destinations are identified by the group of people in the lecture.
  - What else happens? )

# Communications Rules

- The communications channel is accessible by everyone in the lecture room..
  - How is the channel controlled?

